Superhydrophobic surfaces produced using natural silica-based structures with potential for biomedical applications

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Superhydrophobic surfaces (SHS) are characterized for exhibit extreme water repellency. Where water droplets roll easily and have a contact angle higher than 150º. The inspiration to produce artificial SHS comes from nature, the Lotus leaf. Hierarchical surface topographies at micro/nanoscale are critical for this effect.

On biomedical and tissue engineering fields several applications for SHS has been developed. Such as microfluidic platforms to perform studies in mimic *in vivo* environment similar to human body.[1] SHS are also used to produced spherical particles without using any precipitation bath. The method permit to produce particles for controlled drug delivery in one step with high encapsulation efficiency.[2] Cells was also encapsulated and a system to be used in tissue regeneration was obtained.[3] Other promising application for SHS is high-throughput screening. Using SHS, platforms to analyze several materials/formulation at the same time were developed. These platforms permit to perform combinatorial studies with cells/biomaterial to screen cytocompatibility.[4]

Several strategies were developed to produce SHS: polymer reconformation, template method or sol−gel processing. One strategy involve to produce roughness by silica micro/nanoparticles deposition on glass slides. Other is to use natural structures as templates that exhibit the necessary hierarchical structure. These two strategies inspired us to develop a new approach to generate SHS. We use silica-based structures already available in nature to create the necessary hierarchical topography. We use diatomaceous earth directly on the surface and not as templates. The diatomaceous exoskeletons are microstructures with nanotextures. These microstructures was used to coat smooth surfaces and create a hierarchical roughness on surfaces. By fluorosilanization a SHS was achieved. The wettability of the produced surfaces can be precisely controlled by exposing the substrates to plasma treatment for specific times. The control in space of the treatment can be used to imprint hydrophilic patterns on the

SHS. This make promising the use of developed SHS in several of the above cited applications. The developed strategy can be applied in different kinds of substrates.

The versatility of the developed method to produce SHS show high potential for biomedical and tissue engineering applications.

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